Contents

Chairmen's preface xi
Editors' preface xiii

SECTION I. AWARD AND PLENARY PRESENTATIONS

Role of instabilities in determination of the shapes of growing crystals *
R.F. Sekerka 1
Mass production of refractory oxide crystals: cubic zirconia *
J.F. Wenckus 13
Dynamics, stability and control of Czochralski growth *
D.T.J. Hurle 15
Convective instabilities in melt growth configurations *
G. Müller 26
Towards understanding the growth mechanism of III–V semiconductors on an atomic scale *
T. Nishinaga and T. Suzuki 37

SECTION II. CRYSTAL GROWTH FUNDAMENTALS

II.A. *Nucleation, melting, morphology and growth*

Models for the early stages of nucleation
H. Riveros, E. Cabrera, M. Gally, C. Ruiz-Mejia and J. Fujioka 44
Nucleation and growth of fine crystals from supercritical carbon dioxide
E.M. Berends, O.S.L. Bruinsma and G.M. van Rosmalen 50
Fundamental criterion for surface melting
J.P. van der Eerden, T.H.M. van den Berg, J. Huinink and H.J.F. Knops 57
Relevance of surface roughening and surface melting for crystal growth *
J.P. van der Eerden 62
Kinetic roughening in relation to the roughening transition in odd-numbered alkane crystals
X.-Y. Liu and P. Bennema 69
Face statistics on the dissolution forms of garnet crystals *
E. Hartmann and E. Beregi 74
Growth morphologies in diffusion fields *
Y. Saito, T. Sakiyama and M. Uwaha 82
Fluctuation of steps in a surface diffusion field
M. Uwaha and Y. Saito 87
Evolution of a train of interacting steps in a surface diffusion field
M. Uwaha 92
Structure of crystal mother phase interface and crystal growth mechanisms *
P. Bennema 97
Defect mechanisms of crystal growth and their kinetics *
Nai-ben Ming 104
Growth mechanism of long chain molecular crystals on KCl substrate due to annealing
M. Yamanaka, K. Mimura, K. Yase, K. Sato and K. Inaoka 113

* Denotes an invited paper.

Computer simulation of molecular liquids on corrugated crystal surfaces *
T.A. Cherepanova and A.V. Stekolnikov 116
Complete characterization of epitaxial systems from the lattice geometrical point of view. I. Fundamentals
P. Möck 122
Non-equilibrium phase transformations
K.A. Jackson, G.H. Gilmer, D.E. Temkin, J.D. Weinberg and K. Beatty 127
Nucleation in non-critical binary systems
A.S. Myerson and A.F. Izmailov 139

II.B. *Thermal transfer, convection phenomena and segregation*

Control of radiative-conductive heat transfer in shaped semi-transparent crystals pulled from the melt *
V.S. Yuferev, M.G. Vasil'ev, L.A. Stefanova and E.N. Kolesnikova 144
Heat transfer analysis and structure perfection of shaped semi-transparent crystals
I. Nicoară, D. Nicoară and D. Vizman 152
Influence of the solute convection on InGaSb LPE layers on vertically mounted GaSb substrates
Y. Hayakawa, K. Asakawa, Y. Torimoto, K. Yamashita, A. Nakayama and M. Kumagawa 159
Fluid patterns in the diffusive field around a growing crystal
J.-M. García-Ruiz and G. Otálora 163
Coupling of Couette flow and crystal morphologies in directional freezing
Tao Huang, Shan Liu, Yong Yang, Deyang Lu and Yaohe Zhou 167
Directional solidification with ACRT
J. Zhou, M. Larrousse, W.R. Wilcox and L.L. Regel 173
In-situ observation of unidirectional solidification in transparent organic alloy
T. Higashino, Y. Inatomi and K. Kuribayashi 178
Melt dynamics in directional solidification of PbSnTe
K. Grasza and A. Jędrzejczak 183
The role of internal radiation and melt convection in Czochralski oxide growth: deep interfaces, interface inversion, and spiraling
Q. Xiao and J.J. Derby 188
Observation of crystal–melt interface shape in simulated Czochralski method with model fluid
A. Hirata, M. Tachibana, Y. Okano and T. Fukuda 195
Convection and segregation during growth of Ge and InSb crystals by the submerged heater method
A.G. Ostrogorsky, H.J. Sell, S. Scharl and G. Müller 201
Model of the effective segregation coefficient applied to low-convection solidification in microgravity
A.G. Ostrogorsky and G. Müller 207
Growth of 2 inch Ge:Ga crystals by the dynamical vertical gradient freeze process and its numerical modelling including transient segregation
D. Hofmann, T. Jung and G. Müller 213

II.C. *Dendritic growth, patterns and particle formation*

Uniformly valid asymptotic solution for steady dendrite growth in external flow
J.J. Xu 219
Kinetic effect on 2D dendritic growth
Y. Saito and T. Sakiyama 224
Growth of ammonium nitrate phase I and II dendrites
C.A. van Driel, A.E.D.M. van der Heijden and G.M. van Rosmalen 229
Three-dimensional pattern formation during growth of ice dendrites – its relation to universal law of dendritic growth
Y. Furukawa and W. Shimada 234
In-situ observation of growth morphologies in systems with high melting temperatures
W. Schmidbauer, T. Wilke and W. Assmus 240
Surface tension anisotropy and cell-like structure formation in free solidification
V. Pines, M. Zlatkowski and A. Chait 247
Formation of patterns during growth of snow crystals *
E. Yokoyama 251

Effect of high magnetic fields on fractal growth of lead metal-leaves
I. Mogi, S. Okubo and Y. Nakagawa 258
Microscopic condensation processes of niobium microclusters in sputtering
K. Obara 262
A new experimental study on the production of clusters from copper ultrafine particles
C. Kaito, T. Watanabe, K. Ohtsuka, F. Chen and Y. Saito 267
Structure of oxide particles produced by the reaction between Mg ultrafine particle and SiO film
Y. Saito, K. Ohtsuka, T. Watanabe and C. Kaito 271

SECTION III. GROWTH AND CHARACTERIZATION OF SILICON-RELATED AND WIDE-GAP MATERIALS

III.A. *Si and Si / Ge*

Study of characteristics of the crystal temperature in a Czochralski puller through experiment and simulation
T. Fujiwara, S. Inami, S. Miyahara, S. Kobayashi, T. Kubo and H. Fujiwara 275
Facet formation in silicon single crystals grown by VMFZ method
M. Kimura, H. Arai, T. Mori and H. Yamagishi 282
The baroclinic flow instability in rotating silicon melt
M. Watanabe, M. Eguchi, K. Kakimoto, Y. Baros and T. Hibiya 288
Characterization of interstitial oxygen striations in silicon single crystals
I. Fusegawa, H. Yamagishi, T. Mori, H. Takayama, E. Iino and K. Takano 293
Point defect, carbon and oxygen complexing in polycrystalline silicon
J.P. Kalejs 298
Development of non-destructive bulk micro-defect analyzer for Si wafers
K. Moriya, H. Wada and K. Hirai 304
Gravity effect on liquid phase epitaxy of Si
H. Kanai, S. Motoyama, M. Kimura, A. Tanaka and T. Sukegawa 310
Growth of thin crystalline silicon layers for photovoltaic device use
T.F. Ciszek, T.H. Wang, R.W. Burrows and X. Wu 314
RHEED studies of initial stage of Ge film growth on (311)Si by gas source molecular beam epitaxy
Y. Yasuda, K. Itoh, N. Ohshima, Y. Koide and S. Zaima 319
Misfit dislocation formation and interaction in Ge(Si) on Si(001)
M. Albrecht, H.P. Strunk, P.O. Hansson and E. Bauser 327
Growth of heavily-doped SiGe from metallic solutions
A. Borshchevsky and J.-P. Fleurial 331

III.B. *SiC, gems, diamond, GaN and related materials*

Silicon carbide control in the EFG system
S. Rajendran, M. Larrousse, B.R. Bathey and J.P. Kalejs 338
Growth of SiC and SiC–AlN solid solution by container-free liquid phase epitaxy
V. Dmitriev and A. Cherenkov 343
A thermodynamical approach to tetramethylsilane (TMS) pyrolysis; application to SiC coatings obtained by MOCVD
S. Veintemillas-Verdaguer, A. Figueras and R. Rodríguez-Clemente 349
Growth kinetics of vapor-grown SiC
T. Kaneko 354
Growth of large SiC single crystals
D.L. Barrett, J.P. McHugh, H.M. Hobgood, R.H. Hopkins, P.G. McMullin, R.C. Clarke and W.J. Choyke 358
MOCVD SiC layer morphology and texture dependence on thickness and total pressure
J. Santiso, A. Figueras, R. Rodríguez-Clemente, B. Armas, C. Combescure, A. Mazel, Y. Kihn and J. Sévely 363
Epitaxial growth of cubic SiC by hot filament CVD
Y. Hirabayashi, S. Karasawa and K. Kobayashi 369
Growth of solid solutions of aluminum nitride and silicon carbide by metalorganic chemical vapor deposition
I. Jenkins, K.G. Irvine, M.G. Spencer, V. Dmitriev and N. Chen 375
Growth of GaN and AlGaN for UV/blue p–n junction diodes *
I. Akasaki, H. Amano, H. Murakami, M. Sassa, H. Kato and K. Manabe 379

The growth of thick GaN film on sapphire substrate by using ZnO buffer layer
T. Detchprohm, H. Amano, K. Hiramatsu and I. Akasaki 384
The growth of single crystalline GaN on a Si substrate using AlN as an intermediate layer
A. Watanabe, T. Takeuchi, K. Hirosawa, H. Amano, K. Hiramatsu and I. Akasaki 391
Crystal growth in the Mineral Kingdom *
I. Sunagawa 397
Crystal growth of epitaxial CVD diamond using ^{13}C isotope and characterization of dislocations by Raman spectroscopy
S. Karasawa, M. Mitsuhashi, S. Ohya, K. Kobayashi, T. Watanabe, K. Hirai, K. Horiguchi and F. Togashi 403
Effect of ion implantation and surface structure of silicon on diamond film nucleation
K. Kobayashi, M. Kumagai, S. Karasawa, T. Watanabe and F. Togashi 408
Growth of diamond by sequential deposition and etching process using hot filament CVD
J. Wei and Y. Tzeng 413
Synthesis and morphology of CVD diamond on Ta and TaC film
F. Togashi, K. Kobayashi, M. Mitsuhashi, S. Karasawa, S. Ohya and T. Watanabe 418
The separation of natural from synthetic gem-quality diamonds on the basis of crystal growth criteria
E. Fritsch and J.E. Shigley 425
Floating zone growth of monochromator grade crystals of YB_{66}
Y. Kamimura, T. Tanaka, S. Otani, Y. Ishizawa, Z.U. Rek and J. Wong 429

SECTION IV. GROWTH AND CHARACTERIZATION OF III–V COMPOUNDS

IV.A. *Bulk grown materials*

Heat transfer during GaAs growth of bulk single crystal by the liquid encapsulated vertical Bridgman technique
T. Suzuki, Y. Okano, K. Hoshikawa and T. Fukuda 435
LEC growth of large GaAs single crystals
M. Shibata, T. Suzuki, S. Kuma and T. Inada 439
Thermal stress theory of dislocation reduction in the vertical gradient freeze (VGF) growth of GaAs and InP
A.S. Jordan, E.M. Monberg and J.E. Clemans 444
MLEK crystal growth of large diameter (100) indium phosphide
D.F. Bliss, R.M. Hilton and J.A. Adamski 451
Growth and characterization of GaSb single crystals *
F. Moravec 457
GaSb solution growth by the solute feeding Czochralski method
A. Watanabe, A. Tanaka and T. Sukegawa 462
Growth of $Al_xGa_{1-x}Sb$ and GaSb bulk crystals with liquid phase electro-epitaxy (LPEE)
G. Bischopink and K.W. Benz 466
THM growth of $Al_xGa_{1-x}Sb$ bulk crystals
G. Bischopink and K.W. Benz 470
Optical and electrical characterization of $Al_xGa_{1-x}Sb$ crystals grown by the travelling heater method
B.K. Meyer, G. Bischopink, K.W. Benz, A. Schöner and G. Pensl 475
Growth of GaInP thick layers by the modified yo-yo solute feeding method
S. Watabe, K. Tadatomo, T. Sukegawa and A. Tanaka 479
Sequential etching of GaAs
P.E.R. Nordquist, R.L. Henry and R.J. Gorman 483

IV.B. *Epitaxially grown materials*

Equilibrium gas-phase composition and thermodynamic properties including subhydrides in the pyrolysis of AsH_3 and PH_3
A.S. Jordan and A. Robertson 488
Ab initio molecular orbital study on the reaction of TMA with H_2
Y.S. Hiraoka, M. Mashita, T. Tada and R. Yoshimura 494
Monte Carlo simulation of $L1_1$-type ordering due to surface step migration in the epitaxial growth of III–V semiconductor alloys
M. Ishimaru, S. Matsumura, N. Kuwano and K. Oki 499
Novel precursors for organometallic vapor phase epitaxy *
G.B. Stringfellow 503

The growth of InSb using alternative organometallic Sb sources
R.M. Biefeld 511
Hydride-VPE growth of InP and SI InP:Fe in H_2/N_2 ambient
R. Göbel and H. Janning 516
Growth of GaAs on Si by employing AlAs/GaAs double amorphous buffer
W.Y. Uen and T. Nishinaga 521
Improvement of high brightness AlGaAs/GaAs DH red LED under optimum growth conditions
B.T. You, J.S. Shea, J.Y. Kao, J.R. Deng, Y.S. Chang, C.Y. Juan and T.P. Chen 527
Large area epitaxial method for high brightness 655 nm AlGaAs double heterostructure red LEDs
J.S. Shea, B.T. You, J.Y. Kao, J.R. Deng, Y.S. Chang and T.P. Chen 533
A study of group-V element desorption from InAs, InP, GaAs and GaP by reflection high-energy electron diffraction
B.W. Liang and C.W. Tu 538
Defect formation in semiconductor layers during epitaxial growth
B. Steiner, W. Tseng, J. Comas, U. Laor, R.G. Dobbyn and K. Rajan 543
Reduction of surface defects in GaAs layers grown by MBE
H. Kawada, S. Shirayone and K. Takahashi 550
In-situ observation of morphological change on LPE grown surface in semiconductors
Y. Inatomi and K. Kuribayashi 557
Growth and characterization of InGaAs bulk crystals grown by liquid phase electro-epitaxy
M. Yanagase, S. Tanaka, K. Hiramatsu and I. Akasaki 562
Novel applications of contactless characterization techniques in epitaxial crystals and quantum well structures
B.K. Meyer, C. Wetzel, M. Drechsler, A. Moll, H. Linke, P. Omling and F. Scholz 567

SECTION V. GROWTH AND CHARACTERIZATION OF II–VI COMPOUNDS AND TERNARY ALLOYS

The correlation between superheating and supercooling in CdTe melts during unseeded Bridgman growth
M. Mühlberg, P. Rudolph, M. Laasch and E. Treser 571
Vertical Bridgman growth and characterization of large-diameter single-crystal CdTe
L.G. Casagrande, D. Di Marzio, M.B. Lee, D.J. Larson, Jr., M. Dudley and T. Fanning 576
Defects in CdTe Bridgman monocrystals caused by nonstoichiometric growth conditions
P. Rudolph, M. Neubert and M. Mühlberg 582
The growth of a cubic, single phase, $Cd_{0.6}Mn_{0.4}Te$ single crystal by the vertical gradient freeze method
M. Azoulay, A. Raizman, R. Weingarten, H. Shacham and H. Feldstein 588
State and distribution of point defects in doped and undoped Bridgman-grown CdTe single crystals
H. Zimmermann, R. Boyn, C. Albers, K.W. Benz, D. Sinerius, C. Eiche, B.K. Meyer and D.M. Hoffmann 593
TEM investigation of precipitates in $Hg_{0.8}Cd_{0.2}Te$ grown by the travelling heater method
F.M. Kiessling and H.S. Leipner 599
Hg vacancy diffusion in mercury cadmium telluride
M. Neubert, F.M. Kiessling, B. Barz and K. Jacobs 604
Estimation of the optimal conditions for directional crystal growth from the vapour phase with no contact between crystal and ampoule wall
K. Grasza 609
Variation of surface morphology with precursor supply ratio in MOVPE CdTe layers
T. Ferid, M. Ekawa, K. Yasuda, A. Tanaka and M. Saji 613
Control of microtwins in MOCVD of CdTe on sapphire
H.L. Glass, M.R. Appleby Woods, M.L. Buehnerkemper, D.L. Varnum and T.P. Weismuller 617
Self-limiting monolayer epitaxy (SME): a new approach to the growth of wide gap II–VI heterostructures
W. Faschinger, P. Juza, S. Ferreira, H. Zajicek, A. Pesek, H. Sitter and K. Lischka 622
Growth of ZnTe by physical vapor transport and traveling heater method
C.-H. Su, M.P. Volz, D.C. Gillies, F.R. Szofran, S.L. Lehoczky, M. Dudley, G.-D. Yao and W. Zhou 627
Surface structural and morphological characterization of ZnTe epilayers grown on {100}GaAs by MOVPE
N. Lovergine, D. Manno, A.M. Mancini and L. Vasanelli 633
The growth and characterization of cadmium selenide and cadmium zinc selenide epilayers by MOVPE
P.J. Parbrook, A. Kamata and T. Uemoto 639
Growth and characterization of ZnSe for low temperature calorimetry applications
F. Allegretti, A. Carrara and S. Pizzini 646

Epitaxial growth of high quality ZnSe and ZnSe/ZnS superlattices for optical processing
C. Pong, R.S. Feigelson and R.C. DeMattei 650
Crystal growth of $CuInSe_2$ by the method of horizontal Bridgman with two temperature zones
H. Matsushita, S. Endo, T. Irie and H. Nakanishi 655
Method of selenizing liquid Cu–In alloy in growing $CuInSe_2$ single crystals
S. Nomura and T. Takizawa 659
Crystal growth of $AgGaS_2$ by Bridgman–Stockbarger technique using shaped crucibles
E. Treser and V. Krämer 664

SECTION VI. SUPERCONDUCTORS

VI.A. *Substrates for superconductors*

The growth of $NdAlO_3$ single crystals by Czochralski method
Y. Miyazawa, H. Toshima and S. Morita 668
Vertical gradient-freeze growth of aluminate crystals
R.E. Fahey, A.J. Strauss and A.C. Anderson 672
Single crystal growth of pure and Y-substituted $NdAlO_3$ by the floating zone (FZ) method
I. Tanaka, M. Kobashi and H. Kojima 680
Congruent composition for growth of lanthanum aluminate
G.W. Berkstresser, A.J. Valentino and C.D. Brandle 684
The growth of $DyAlO_3$ single crystals by Czochralski method
H. Sekiwa, S. Morita and Y. Miyazawa 689
Anomalies in crystal growth by Czochralski technique
A. Pajączkowska and P. Byszewski 694
Flux growth of single crystals of $Nd_yPr_{1-y}GaO_3$ solid solutions as substrates for high temperature superconductor films
H. Dabkowska, A. Dabkowski and J.E. Greedan 699
Single crystal growth of rare-earth gallates and epitactic growth nature of high-T_c superconducting YBCO thin films on them
S. Miyazawa, M. Sasaura and M. Mukaida 704
Investigation of the growth of neighborite, $NaMgF_3$
S. Sengupta, A. Cassanho and H.P. Jenssen 709
Deposition of epitaxial Cu_2O films on (100) MgO by laser ablation and their processing using ion beams
S.B. Ogale, P.G. Bilurkar, N. Mate, N. Parikh and B. Patnaik 714

VI.B. *Superconducting materials and related topics*

Growth of superconducting whiskers in the Bi system *
I. Matsubara, H. Yamashita and T. Kawai 719
Crystal growth, characterization and physical properties of $Bi_2Sr_2CaCu_2O_{8+x}$
O. Bonfigt, H. Somnitz, K. Westerholt and H. Bach 725
Phase analysis of Bi–Ca–Sr–Cu–O superconducting films at different growth temperatures from KCl supercooled solutions
K.K. Raina, S. Narayanan and R.K. Pandey 729
Crystal growth and superconductivity of $Bi_{1.7}Pb_{0.3}Sr_2CaCu_2O_8$
L. Zhang, J.Z. Liu, M.D. Lan, P. Klavins and R.N. Shelton 734
Improved thermogravimetric analysis and crystal growth of Bi–Sr–Ca–Cu–O
B. Wanklyn, E. Dieguez, Chen Changkang, A.K. Pradhan, J.W. Hodby, Hu Yongle, D. Smith, F. Wondre and P.A.J. de Groot 738
Improvement of superconductivity in YBCO single crystals
Wang Yao-Shui, P. Bennema, Zheng Man-na, C.M. Fu, C. Grey, L.W.M. Schreurs, Q. Xu, P. van der Linden and Y. Bruynseraede 744
Phase separation during solution growth of $YBa_2Cu_3O_{7-\delta}$ single crystals using a pulling technique
C.T. Lin, E. Schönherr, H. Bender, W.Y. Liang and J.S. Abell 747
On the flux growth and some properties of superconducting $YBa_2Cu_3O_{7-x}$ single crystals and LPE films
P. Görnert, K. Fischer and C. Dubs 751

Crystal growth mechanism of $YBa_2Cu_3O_y$ superconductors with peritectic reaction
T. Izumi, Y. Nakamura and Y. Shiohara 757
Microscopic studies of YBCO single crystals
A. Drake, M. Aindow, M. Rand and J.S. Abell 762
The phase diagram and crystal growth of $(Y_{1-x}Pr_x)Ba_2Cu_3O_{7-x}$
Chen Changkang, Hu Yongle, B.M. Wanklyn, S. Hazell, A.K. Pradhan, J.W. Hodby, A. Boothroyd and F.R. Wondre 767
X-ray characterization of laser ablated textured $YBa_2Cu_3O_{7-x}$ thin films on Si, Zr, MgO and $SrTiO_3$ substrates
M. Steins, F. Mattheis, R. Gaebel, K. Bente and H.-U. Krebs 772
Metalorganic chemical vapor deposition of $YBa_2Cu_3O_{7-\delta}$ on $SrTiO_3$ and $LaAlO_3$
W.J. DeSisto, R.L. Henry, H.S. Newman, M.S. Osofsky and V.C. Cestone 777
Single source MOCVD of epitaxial oxide thin films *
R. Hiskes, S.A. DiCarolis, R.D. Jacowitz, Z. Lu, R.S. Feigelson, R.K. Route and J.L. Young 781
Solid source MOCVD for the epitaxial growth of thin oxide films
Z. Lu, R.S. Feigelson, R.K. Route, S.A. DiCarolis, R. Hiskes and R.D. Jacowitz 788
Thin film growth behavior of $YBa_2Cu_3O_{7-\delta}$ in sequential deposition with high-purity ozone gas
T. Shimizu, H. Nonaka and K. Arai 793
Top-seeded growth of superconducting $(Ba_{1-x}K_x)BiO_3$ crystals by an electrochemical method
P.D. Han, L. Chang and D.A. Payne 798
Preparation and superconductivity of $Ba_{1-x}K_xBiO_3$ single crystals
W.D. Mosley, J.Z. Liu, A. Matsushita, Y.P. Lee, P. Klavins and R.N. Shelton 804
Growth and crystal structure of $LiCuO_2$
K. Imai, M. Koike, K. Sawa and K. Takei 808
Growth of large pure, doped and co-doped La_2CuO_4 single crystals
A. Cassanho, B. Keimer and M. Greven 813
Surface analysis of $Ln_{2-x}Ce_xCuO_4$ (Ln = Pr and Nd) single crystals grown by the top seeded solution method
L.C. Sengupta, S. Sengupta, W.E. Kosik and J.D. Demaree 817

SECTION VII. OXIDE CRYSTALS

The growth of dome-shaped sapphire crystals by the gradient solidification method (GSM)
A. Horowitz, S. Biderman, D. Gazit, Y. Einav, G. Ben-Amar and M. Weiss 824
Growth of TiO_2 ribbon single crystals by edge-defined film-fed growth method
H. Machida, K. Koshikawa and T. Fukuda 829
Modelling of directional solidification of BSO
C. Lin and S. Motakef 834
Crystal growth of compounds in the $MgO–Nb_2O_5$ binary system
E. Brück, R.K. Route, R.J. Raymakers and R.S. Feigelson 842
Growth of EuO crystals by a solution sintering process
K.J. Fischer, U. Köbler, B. Stroka, K. Bickmann and H. Wenzl 846
Solid–liquid interface in the growth of sillenite-type crystals
J. Martinez-Lopez, M.A. Caballero, M.T. Santos, L. Arizmendi and E. Dieguez 852
CVT growth and characterization of $Zn_{1-x}Mn_xCr_2O_4$ single crystals
F. Leccabue, B.E. Watts, C. Pelosi, D. Fiorani, A.M. Testa, A. Pajączkowka, G. Bocelli and G. Calestani 859
Flux growth and properties of $RbTiOAsO_4$ (RTA) crystals
Jianru Han, Yusheng Liu, Min Wang and Dezhen Nie 864
Growth of large $PbTiO_3$ crystals by a self-flux technique
B.N. Sun, Y. Huang and D.A. Payne 867
Hydrothermal growth of bismuth silicate (BSO)
J. Larkin, M. Harris, J.E. Cormier and A. Armington 871

SECTION VIII. NON-LINEAR OPTICAL CRYSTALS

$Bi_6Te_2Mo_2O_{21}$ – a new synthetic crystal and its physical properties
Deng Mengxiang and Yang Xiuzhen 876

Growth and properties of a new TB type photorefractive crystal
H.C. Chen, D.L. Sun, Y.Y. Song and Q.Z. Jiang 880
Growth of a first organic photorefractive crystal
J. Hulliger, K. Sutter, Y. Schumacher, B. Březina and V.A. Ivanshin 886
Czochralski and modified Bridgman–Stockbarger growth of pure, Cd^{2+} and Nd^{3+} doped benzil single crystals
M.D. Aggarwal, W.S. Wang and M. Tambwe 891
Growth of large size $KNbO_3$ crystals and epitaxial layers of $KTa_{1-x}Nb_xO_3$ *
J. Hulliger, R. Gutmann and K. Wüest 897
Orthoscopic investigation of the axial optical and compositional homogeneity of Czochralski grown $LiNbO_3$ crystals
I. Baumann, P. Rudolph, D. Krabe and R. Schalge 903
Growth and characterization of off-congruent $LiNbO_3$ single crystals grown by the double crucible method
Y. Furukawa, M. Sato, K. Kitamura and F. Nitanda 909
$LiNbO_3$ single crystal growth from Li-rich melts by the continuous charging and double crucible Czochralski methods
S. Kan, M. Sakamoto, Y. Okano, K. Hoshikawa and T. Fukuda 915
Growth and characterization of Sc_2O_3-doped $LiNbO_3$
J.K. Yamamoto, K. Kitamura, N. Iyi, S. Kimura, Y. Furukawa and M. Sato 920
Growth and characterization of $Li_2B_4O_7$ single crystals grown by novel Bridgman technique using a graphite container
T. Katsumata, H. Konoura, H. Imagawa, A. Konno, K. Takei, M. Shinohara, K. Kano and K. Takahashi 924
Deposition of $LiNbO_3$ thin films on c-axis oriented epitaxial $Y_1Ba_2Cu_3O_{7-\delta}$ films by pulsed excimer laser ablation
S.B. Ogale and R. Nawathey-Dikshit 929
Surface stability of lithium triborate crystals grown from excess B_2O_3 solutions
E. Brück, R.J. Raymakers, R.K. Route and R.S. Feigelson 933
β-BaB_2O_4 single crystal growth by Czochralski method using α-BaB_2O_4 and β-BaB_2O_4 single crystals as starting material
H. Kouta, S. Imoto and Y. Kuwano 938
Molecular dynamics study on the liquid structures of BaB_2O_4 just after melting
H. Ogawa and Y. Waseda 945
Growth and optical characterization of large potassium titanyl phosphate crystals
T. Sasaki, A. Miyamoto, A. Yokotani and S. Nakai 950
Hydrothermal growth of potassium titanyl arsenate (KTA) in large autoclaves
R.F. Belt and J.B. Ings 956
Growth of $KTiOAsO_4$ (KTA) and $CsTiOAsO_4$ (CTA) crystals from new molten salt system
Luo Chuhua, Gu Kaihui, Zhai Ning, Zheng Chongzhong, Xie Qiuxiang and Luo Fei 963
Growth by LPE of Nd:YAG single crystal layers for waveguide laser applications
B. Ferrand, D. Pelenc, I. Chartier and Ch. Wyon 966
The crystal growth behaviour of the organic non-linear optical material 2-(α-methylbenzylamino)-5-nitropyridine (MBANP)
P.J. Halfpenny, R.I. Ristić, E.E.A. Shepherd and J.N. Sherwood 970
Nonlinear optical characteristics of binary organic system
N.B. Singh, T. Henningsen, R.H. Hopkins, R. Mazelsky, R.D. Hamacher, E.P. Supertzi, F.K. Hopkins, D.E. Zelmon and O.P. Singh 976
The growth, structural and optical characterization of large area, single crystalline thin films of 3-nitroaniline (mNA)
J.N. Sherwood and G.S. Simpson 981

SECTION IX. LASER CRYSTALS, OXIDES, GARNETS AND FLUORIDES

Crystal growth and characterization of new laser materials
R. Collongues, A.M. Lejus, J. Théry and D. Vivien 986
Growth and perfection of chromium-doped forsterite
Bing Hu, Hongbi Zhu, Peizhen Deng and Peicong Pan 991
The behavior of chromium ions in forsterite
Y. Yamaguchi, K. Yamagishi and Y. Nobe 996
Czochralski growth of rare earth oxyorthosilicate single crystals
C.L. Melcher, R.A. Manente, C.A. Peterson and J.S. Schweitzer 1001
Physical properties of a $Y_3Al_5O_{12}$ melt
V.J. Fratello and C.D. Brandle 1006
Growth of gadolinium indium gallium garnet (GInGG) single crystal by the floating zone method
M. Kawata, H. Toshima, Y. Miyazawa and S. Morita 1011

Disordered oxide crystal hosts for diode pumped lasers
M.H. Randles, J.E. Creamer and R.F. Belt 1016
Growth and characterization of calcium niobium gallium garnet (CNGG) single crystals for laser applications
K. Shimamura, M. Timoshechkin, T. Sasaki, K. Hoshikawa and T. Fukuda 1021
Crystal growth of YVO_4 using the LHPG technique
S. Erdei and F.W. Ainger 1025
$CaClF:Sm^{2+}$ crystal growth and spectroscopy
J.P. Chaminade, A. Garcia, J.C. Vial and R.M. Macfarlane 1031
Characterization of the $LiSr(Al,Cr)F_6$ solid solution for Cr-laser applications
W.L. Kway, B. Rupp and J.B. Tassano 1036

SECTION X. HALIDES

Recent advances in bulk crystal growth from the vapour: the case of α-HgI_2 *
M. Piechotka, G. Wetzel, A. Rossberg, H.-J. Schwer, M. Zha and E. Kaldis 1040
Processing α-mercuric iodide by zone refining
A. Burger, S.K. Morgan, D.O. Henderson, Y. Biao, K. Zhang, E. Silberman, D. Nason, L. van den Berg, C. Ortale-Baccash and E. Cross 1047
The optical quality of mercurous halide crystals
N.B. Singh, M. Gottlieb, R. Mazelsky and W.M.B. Duval 1053
Automated pulling from the melt – an effective method for growing large alkali halide single crystals for optical and scintillation applications
L.G. Eidelman, V.I. Goriletsky, V.G. Protsenko, A.V. Radkevich and V.V. Trofimenko 1059
The effect of forced convection on the melt gradient and growth rate during the Bridgman and gradient freeze crystal growth of silver-doped lead bromide
R.C. DeMattei and R.S. Feigelson 1062
Growth of single crystals of fast-ion conducting binary and ternary copper and silver halides for neutron scattering
C. Heremans and B.J. Wuensch 1069
Characterization of modified pyrochlores $CsMFeF_6$ (M = Mn, Co and Zn)
K.S. Raju and B.M. Wanklyn 1078
Growth of some group V–VI–VII compounds from the vapour
R. Ganesha, D. Arivuoli and P. Ramasamy 1081

SECTION XI. QUASICRYSTALS AND SPECIAL TOPICS AND TECHNIQUES

Growth of perfect quasicrystals, from curiosity to reality *
A.R. Kortan, F.A. Thiel, N. Kopylov and K.S. Chen 1086
Growth of $Tb_{0.27}Dy_{0.73}Fe_2$ magnetostrictive single crystals
Qiang Li, Y.L. Zhang, R.Z. Yuan, X.H. Huang and D.J. Jin 1092
Structure of tetrapod-like ZnO crystals
M. Fujii, H. Iwanaga, M. Ichihara and S. Takeuchi 1095
Morphology and growth mechanism of new-shaped ZnO crystals
M. Kitano, T. Hamabe, S. Maeda and T. Okabe 1099
Formation of secondary twins in thin films
S. Maruyama 1104
Crystal growth and properties of $Ag_{1-x}TaSe_{6-x}I_x$ $(0 \leq x \leq 1)$
H. Wada and A. Sato 1109
Boron-rich crystals in Al–M–B (M = Li, Be, Mg) systems grown from high-temperature aluminum solutions
I. Higashi, M. Kobayashi, S. Okada, K. Hamano and T. Lundström 1113
Single crystals of TaB, Ta_5B_6, Ta_3B_4 and TaB_2, as obtained from high-temperature metal solutions, and their properties
S. Okada, K. Kudou, I. Higashi and T. Lundström 1120
Preparation and characterization of the filled tetrahedral semiconductor LiZnP film on InP(111)
K. Kuriyama, Y. Takahashi and T. Kato 1125
Thermal aspects of particle engulfment by a solidifying front
M. Yemmou, M.A. Azouni, P. Casses and G. Pétré 1130

Direct evidence for melting transition at interface between ice crystal and glass substrate
Y. Furukawa and I. Ishikawa 1137
Very large melting point depression of water in silica
J.C. van Miltenburg and J.P. van der Eerden 1143
Oriented growth of silica molecular sieve crystals as supported films
J.C. Jansen and G.M. van Rosmalen 1150
Interfacial thermodynamics of noncritical clusters and homogeneous nucleation in multicomponent systems
K. Nishioka, I. Kusaka and A. Mori 1157
New cluster–cluster aggregation model for formation process of fractal structure in sol–gel transition of SiO_2
M. Kudoh, X. Hu, K. Ohno and Y. Kawazoe 1162
Pressure dependence of prototype structures of metastable niobium oxides
K. Obara 1166
Separation in metallic melts
J. Proschmann, Th. Strangfeld and H. Bach 1172
The role of growth environment on the crystallization of normal alkanes in the homologous series from $C_{18}H_{38}$ to $C_{29}H_{60}$
A.R. Gerson, K.J. Roberts, J.N. Sherwood, A.M. Taggart and G. Jackson 1176
Light scattering kinetics study of cyclopropane hydrate growth
J.P. Monfort and A. Nzihou 1182
A technique for measuring the heat transfer coefficient inside a Bridgman furnace
W. Rosch, W. Jesser, W. Debnam, A. Fripp, G. Woodell and T.K. Pendergrass 1187
Study of directional crystallization process in a cold container with direct radio-frequency heating
V.V. Osiko, D.L. Penyaz and N.P. Khaneev 1193
Powder metallurgy of Ge, Si, and Ge–Si
J. Schilz and M. Langenbach 1197

SECTION XII. AQUEOUS SOLUTIONS

XII.A. *Biomaterials*

The influence of impurities on protein crystallization; the case of lysozyme *
B. Lorber, M. Skouri, J.-P. Munch and R. Giegé 1203
On the morphological and chemical stability of vitamin C crystals
S. Halász and B. Bodor 1212
The influence of growth environment on the crystallization of nortriptyline hydrochloride, a tricyclic antidepressant
M.L. MacCalman, K.J. Roberts and B.A. Hendriksen 1218
Thermal methods for crystallizing biological macromolecules
R.C. DeMattei and R.S. Feigelson 1225
Light scattering investigations of protein and virus crystal growth: ferritin, apoferritin and satellite tobacco mosaic virus
A.J. Malkin and A. McPherson 1232

XII.B. *Organics and phosphates*

Effect of impurities on the processes of crystal growth *
K. Sangwal 1236
Predictions with UNIFAC of liquid–solid phase diagrams: application to water–sucrose–glucose, water–sucrose–fructose and water–xylose–mannose
N. Gabas and C. Laguérie 1245
Growth morphology of berlinite crystals obtained under hydrothermal conditions
J. Gómez-Morales, R. Rodríguez-Clemente, J. Durand and L. Cot 1250
The crystallization of highly perfect metal-free phthalocyanine powders for "ab-initio" structure solution by diffraction methods
P.G. Fagan, K.J. Roberts and R. Docherty 1257
Using in-situ synthrotron radiation powder diffraction to characterize growth-related structural polymorphic phase transformations in cis-9-ω-octadecenoic acid
S.R. Craig, K.J. Roberts, J.N. Sherwood, K. Sato, Y. Hayashi, M. Iwahashi and R.J. Cernik 1263

XII.C. Industrial crystals

Investigations of the effects of some additives on the crystallization of tetrahydrate sodium perborate
C. Frances, B. Biscans, N. Gabas and C. Laguérie 1268
Solvents for the growth of $BaFe_{12-(x+y)}Co_xSn_yO_{10}$ bulk crystals from high-temperature solution
X. Ruiz, V. Nikolov, F. Sandiumenge, R. Solé, R. Cabré, M. Aguiló and F. Díaz 1273
Characterizing the effect of growth conditions and crystal habit on the distribution of imperfections amongst populations of crystals
C.J. Price 1277
Lead chloride crystal growth from boiling solutions
S. Veintemillas-Verdaguer, R. Rodríguez-Clemente and J. Torrent-Burgues 1282
Growth-in-gel zeolite crystallization and transport phenomena
H. Zhang, Y. Kamotani and S. Ostrach 1288

Report on the Meetings of the IOCG Executive Committee, Council and General Assembly held during ICCG-10 in San Diego, California, USA, 16–21 August 1992 1293

Author index 1297
Subject index 1311